These amendments enable the claims to more clearly define the invention. For example, the phrase, "liftable and flight-worthy structural component" in Claim 1 was recognized as being imprecise and unclear. As an illustration, if a plain steel bar were placed inside a plane, and flown around in the plane, that arguably might make the steel bar a "liftable and flight-worthy structural component". Therefore, that phrase has been replaced by "winged aircraft", which is much more direct and clear. The winged aircraft is depicted in the drawings as subassembly 300.

Similarly, the term "conventional" was deleted from the phrase "conventional aircraft engine", after it was recognized that the phrase used in the specification, "conventional propeller or jet engines" was badly-drafted and ambiguous (since it is not clear whether the adjective "conventional" refers to propeller engines only, or also applies to jet engines; this is similar to the classic "French bread and wine" ambiguity that law students learn about, in classes on drafting contracts). Jet engines are regarded as conventional, and the term "aircraft engine" in the amended claims clearly includes both propeller engines, and jet engines. Beyond that, since opinions and interpretations can differ, and can change over time, as to what is "conventional", it is not a good word choice for any patent claim.

Newly submitted claim 5, which relates to controlled deflation creating an altered external shape for the dirigibles, does not add new matter. It is directly supported by a paragraph on page 15 of the specification, which describes controlled deflation using internal mechanical "spines" that can be lengthened or shortened, to create a partially-deflated shape with a dominant vertical axis (comparable to an angel fish) or a dominant horizontal axis (comparable to a stingray).

ANALYSIS RE: PRIOR ART

The Examiner is sincerely thanked for locating and citing various items of prior that previously were unknown to the Inventor/Applicant. They were interesting, and the JP Aerospace website that was cited by the Examiner led to additional research and contacts by the Applicant, who was not previously aware of JP Aerospace.

However, the items cited by the Examiner shrink to the level of historical curiosities, compared to several more directly relevant items cited in the enclosed Information Disclosure Statement. Those items (all of which are fairly recent and current) are the most directly

relevant art that is known to the Applicant. Those items are:

1) A review article, Sarigul-Klijn et al, "Flight mechanics of manned sub-orbital reusable launch vehicles with recommendations for launch and recovery," published by the American Institute of Aeronautics and Astronautics in 2003. This review is of particular value; as stated in the first sentence of the abstract, "***An overview of every significant method of launch and recovery for manned suborbital Reusable Launch Vehicles (RLV) is presented here***" (emphasis added). In other words, this article provides a study of the entire field, written by experts, and accepted and published by the AIAA, the world's foremost organization in this field of endeavor. It was published in 2003, the same year the application was filed, which makes it directly pertinent to the art that existed when the application was filed.

2) The entry entitled "rockoons" (a hybrid word, created by combining rocket with balloon) from the *Encyclopedia Astronautica*, downloaded from www.astronautix.com/lvs/rockoon.htm.

3) A brochure by JP Aerospace, entitled, "ATO Airship to Orbit: Cheap, Bulk, Safe Access to Space", downloaded from www.jpaerospace.com. This brochure provides an overview and illustrations of the three proposed components of their system, which have been named: (i) the Ascender Airship, a V-shaped airship that is intended to use both helium buoyancy and propellers to act as a ferry from the ground to 140,000 feet; (ii) the Dark Sky Station, a 5-armed "star" intended to be two miles wide, and intended to float 140,000 feet above the earth; and, (iii) a second V-shaped vehicle, intended to be more than a mile long, and intended to use buoyancy to reach 200,000 feet, and then to use an ion/electrical drive to power and lift it the rest of the way to orbit. None of those systems have been actually built.

4) A summary sheet (referring to "American Scaled Composites Team", downloaded from www.xprize.org/teams) describing the system that won the $10,000,000 "Ansari X Prize" in late 2004, for two flights in quick succession into

suborbital space. That system used a winged aircraft with turbojet engines (the "White Knight") to lift a smaller vehicle ("SpaceShipOne") to about 50,000 feet. The smaller vehicle was then released, and it used a rocket engine to carry it to an altitude of about 210,000 feet, after which it glided down and landed on a standard runway.

5) A second summary sheet describing another "X Prize" competitor, called the "Da Vinci" project (downloaded from www.davinciproject.com). The people involved in that project were attempting to develop a single helium balloon that could lift a small suborbital vehicle up to 80,000 feet, before igniting the rocket engine on the small suborbital vehicle.

6) A summary sheet describing the "CVX Earth-to-Orbit System" being studied and tested by Transformational Space Corporation. As illustrated on page 4, this system drops a relatively small rocket from a large carrier plane. The rocket is initially horizontal, while being carred by the plane. After release, the rocket takes about 5 seconds to rotate into a vertical direction, using a so-called "trapeze-lanyard air drop" (t/LAD) system. While the rocket is still rotating, the rocket engine begins to fire. By the time the rocket engine provides enough thrust to begin ascending, the carrier plane has flown out of the pathway of the rocket, thereby enabling an "aft-crossing" air launch.

A review of all those items discloses two crucial points that must be recognized, when evaluating the current invention against the prior art.

The first crucial point is this: even though many skilled scientists and engineers have devoted many years of effort, trying to develop bette r and more efficient ways to launch rockets, none of them ever figured out how to effectively merge and combine two very different types of components: (1) large, bulky, and cumbersome helium-filled dirigibles, to enable gentle but slow vertical lifting; with (2) a winged system that can establish a horizontal flying speed of hundreds of miles per hour.

Those two different types of lifting systems work in such completely different ways that they normally would be regarded as totally incompatible with each other. As an example

to illustrate that point, try to imagine a conventional jet achieving enough speed to take off, from a runway, if it must also tow a large dirigible, on a tether, floating above and behind the jet. The drag created by the dirigible clearly would prevent the jet from achieving takeoff speed.

That point deserves emphasis, and it is highlighted and underscored by the comments and assessment under the heading, "Balloon Launch", in column 2 of page 10 of the 2003 review article by Sarigul-Klijn et al. That section on "Balloon Launches" is remarkable for its brevity; it is only 3 sentences long, and 2 of those 3 sentences are clearly and directly negative and discouraging. Its brief commentary points out that (1) launches can occur only on calm days, and (ii) the potential for damaging either the balloon, or things on the ground, is high.

The 3-sentence passage on "Balloon Launches" in the Sarigul-Klijn review does not bother to describe any examples of balloon-assisted rocket launches; however, a chronology of such launches from 1949 through 1957 was found in the *Encyclopedia Astronautica*, and a printout is enclosed. A large portion of that entry apparently was copied from a NASA summary paper entitled "NASA Sounding Rockets, 1958-1968 - A Historical Summary", by William R. Corliss, published by NASA in 1971 (publn. number NASA SP-4401). Those launches were limited to using relatively small weather balloons, to lift rockets that were in the "hobby" class, in terms of size and weight. Those small experimental rockets could momentarily reach suborbital heights (i.e, "the edge of the atmosphere"), before they fell back to earth. However, they did not even begin to approach the size, weight, and power that would be required to reach a stable orbit with a payload.

Also, the passage from the *Encyclopedia Astronautica* explicitly states, "Once enough altitude is attained, the rocket is fired by radio signal ***straight up through the balloon***." (emphasis added). This makes it clear that no effort was being made to develop a system that even remotely resembles the system described in the current patent application.

The key insight that led to the current invention arose from the realization that a multi-stage, multi-component system, as disclosed in the patent application, can enable a complete system to undergo a crucially important transition, as the slow vertical-lift portion of a launch is being completed (with the help of helium-filled dirigibles), when the high-speed horizontal flying stage (using a winged craft) must be commenced. The conception and

design of a complete multi-part system that can accomplish that transition. at a high altitude, was not simple, it was not obvious, and it has never previously been proposed by anyone or anything known to the Applicant.

Another key insight that led to this system was the realization that an entire array of reusable helium-filled dirigibles can provide multiple thousands of tons of lift, ***if*** they are properly affixed to a barge-type unit that contains pumps and high-pressure tanks. This system allows the creation of entire arrays of dirigibles, coupled to a "tank barge" in ways that can provide much greater lifting force than could ever be provided by just a single dirigible. It also enables the helium or other buoyant gas to be recovered and reused, multiple times. It also enables the "tank-barge" with its pumping system to deflate the dirigibles in a controlled manner, thereby enabling both:

(i) limited forward flight, in a manner that will begin towing the partially-deflated dirigibles through the thin upper atmosphere while the dirigibles continue to provide large amounts of lifting force. This is a crucial transitional stage, which enables the rotatable wings on the winged aircraft to be rotated through a portion of their arc, from vertical to horizontal, while buoyancy from the dirigibles is still being provided. That type of "assisted transition" is essential to getting the winged unit (with a heavy, fully-loaded rocket suspended beneath it) ready for independent forward flight, after they are released from the tank barge and dirigibles;

(ii) controlled deflation and shrinkage of the dirigibles, using spring-loaded, screw-driven, or other controllable frame structures inside the dirigibles, in a manner that enables a controlled transition from fully-inflated blimp-like shapes (which provide maximum buoyancy and lift, but which cannot be towed at the speeds that will generate sufficient lift for a winged aircraft) into semi-flat streamlined shapes, comparable to fish, which can enable both (1) towing at increasingly high speeds, while the dirigibles remain tethered to the winged aircraft and rocket as the winged aircraft established forward flight, and (2) controlled descent with the tank-barge unit, after that subassembly has released the winged aircraft and the rocket.

Those types of transitions, carried out at high altitude, are not obvious. However, they are essential to the complete system. A lift-and-launch system for a large rocket that carries enough fuel to lift a heavy payload to a stable orbit (rather than just briefly reaching a

suborbital height, before falling back to earth) cannot function properly, unless it has been designed to go through that critical transition from slow vertical lifting, to high-speed forward flight. None of the prior art systems addressed that type of transition, which must be achieved when huge subassemblies that operate in completely different ways are being combined into a single combined system.

Finally, another crucial point must also be recognized when the current invention is compared against the prior art.

Even though many skilled scientists and engineers have devoted many years of effort to this type of task, none of them ever figured out how to create a system that can lift large, heavy, and powerful rockets (up to and including rockets in the "Saturn" class) into the upper atmosphere. Instead, all previous systems used an airplane to ferry a small (even tiny) craft up into the middle-atmosphere. Military research in the late 1950's and 1960's used modified B-52 bombers to carry up small winged rockets, which went through a series of designs that led to the famous "X15" winged rocket. However, those "ferried rockets" were small one-person vehicles that could only carry out research. They could not reach orbit, and they could not deliver any useful payload up to an orbital height.

Similarly, the system that recently won the X-Prize was also a conventional winged craft, with unusually wide spacing of the landing gear to enable a small winged rocket to be held beneath the larger carrier. That system cannot reach orbit, and it cannot lift any payload up to a height that even begins to approach an orbital height.

By contrast, the current system is specifically designed for lifting large and heavy rockets, with heavy payloads, up to orbital heights (or even beyond, such as on missions to the moon or Mars). The challenges posed by that goal are totally different from the challenge of lifting a pilot and a few wealthy passengers up to the edge of space, on a brief thrill-ride. The current system is not designed for thrill-rides; instead, it is offered and intended as a way to help people, companies, and countries to begin moving forward much more rapidly, and at much lower expense, toward constructing actual and permanent colonies on the moon, and eventually on Mars and beyond. This type of work cannot even hope to proceed, unless a company that is considering taking on the challenges posed by this concept can be assured of a return on its investments. That will require patent coverage.

CONCLUSION

For the reasons discussed above, it is believed that the amended claims are patentable over all known prior art, and are in condition for allowance. If any questions remain, please contact the undersigned at 314-822-8558.

Respectfully submitted,

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